

**UNITED STATES PATENT APPLICATION**

**OF**

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**FOR**

**FILTER COVER ASSEMBLY OF WASHING MACHINE**

[0001] This application claims the benefit of Korean Application(s) No. 10-2002-0075024 filed on November 28, 2002, which is/are hereby incorporated by reference.

## BACKGROUND OF THE INVENTION

### Field of the Invention

[0002] The present invention relates to a filter assembly of a washing machine for removing particles from water, and more particularly, to a filter assembly of a washing machine which opens/closes a filter hole provided in a cabinet to replace a filter.

### Discussion of the Related Art

[0003] Generally, a washing machine is an apparatus for eliminating dirt or filth attached to a laundry using reaction between water and detergent.

[0004] Such a washing machine is classified into a pulsator type, an agitator type, and a drum type. The agitator type washing machine rotates an agitator protruding from a bottom center of a tub in forward and reverse directions to perform washing. The pulsator type washing machine rotates a disc-type pulsator on a bottom of a tub in forward and reverse directions to perform washing using a frictional force between a generated current and a laundry. And, the drum type washing machine rotates a drum holding water, detergent, and laundry at low speed to perform washing. In this case, a plurality of tumbling ribs protrude from an inside of the tub.

[0005] If washing is performed using one of the various type washing machines, particles such as lint and the like are separated from the laundry. Lots of particles are accordingly contained in the used water after completion of the washing.

[0006] Meanwhile, the used water is generally discharged outside using a drain pump. In such a case, such particles as lint and the like are frequently stuck in an impeller of the

drain pump or a motor shaft, whereby drain capacity of the washing machine is lowered, noise is generated, and the drain pump may be out of order.

[0007] Lately, many efforts are made to development of a washing machine equipped with a filter assembly enabling to remove particles involved in water.

5 [0008] Moreover, since particles are naturally gathered in a filter of an operating washing machine, the filter should be cleaned or replaced. Hence, a hole for taking out the filter and a cover for opening/closing the hole should be provided to a cabinet of the washing machine.

[0009] However, the cover should block the opening tightly as well as be detachable  
10 with ease. Besides, the cover provided at an outside of the cabinet should not spoil the exterior beauty of the washing machine.

## SUMMARY OF THE INVENTION

[0010] Accordingly, the present invention is directed to a filter assembly of a washing  
15 machine that substantially obviates one or more of the problems due to limitations and disadvantages of the related art.

[0011] An object of the present invention, which has been devised to solve the foregoing problem, lies in providing a filter assembly of a washing machine, by which a hole provided on an outside of a cabinet is securely covered.

20 [0012] It is another object of the present invention to provide a filter assembly of a washing machine, which provides an improved structure to be open with ease.

[0013] It is another object of the present invention to provide a filter assembly of a washing machine, by which the exterior beauty of a cabinet is preserved.

[0014] Additional features and advantages of the invention will be set forth in the

description which follows, and in part will be apparent to those having ordinary skill in the art upon examination of the following or may be learned from a practice of the invention. The objectives and other advantages of the invention will be realized and attained by the subject matter particularly pointed out in the specification and claims hereof as well as in the  
5 appended drawings.

[0015] To achieve these objects and other advantages in accordance with the present invention, as embodied and broadly described herein, there is provided a filter cover assembly of a washing machine including a cover fitted to a filter hole provided at a cabinet of the washing machine for loading/unloading a filter, three protrusions extending downward from  
10 left, right, and central sides of a lower end of the cover to be inserted in holes at left, right, and central portions of a lower side of a filter case provided in the cabinet, respectively to communicate with the filter hole, and three hooks protruding from left, right, and central sides of an upper end of the cover toward the filter case to be inserted in hook holes at left, right, and central portions of an upper side of the filter case, respectively.

15 [0016] In this case, at least one of the protrusions may include at least one slit provided along a length direction of the corresponding protrusion to elastically deform both lateral sides of the corresponding protrusion inward and outward and a barb protruding outward from lower ends of both of the lateral sides of the corresponding protrusion to prevent the corresponding protrusion having inserted in the hole from being separated from  
20 the hole.

[0017] And, each of the hooks may include an extension part protruding from an upper end of the cover toward the filter case, an elastic part bent from an end of the extension part toward the cover to have elasticity upward and downward, and a barb protruding from an upper surface of the elastic part to be inserted in the corresponding hook hole. In this case,

each of the hooks may further include a push piece extending from the elastic part to facilitate a user to push.

[0018] It is to be understood that both the foregoing explanation and the following detailed description of the present invention are exemplary and illustrative and are intended to provide further explanation of the invention as claimed.

#### BRIEF DESCRIPTION OF THE DRAWINGS

[0019] The accompanying drawings, which are included to provide a further understanding of the invention and are incorporated in and constitute a part of this application, illustrate embodiment(s) of the invention and together with the description serve to explain the principle of the invention. In the drawings:

[0020] FIG. 1 is a perspective view of a washing machine according to a first embodiment of the present invention;

[0021] FIG. 2 is a perspective view of the washing machine in FIG. 1, in which an interior of the washing machine is partially shown;

[0022] FIG. 3 is a perspective view of the washing machine in FIG. 1, in which cover and filter disassembled from the washing machine is shown;

[0023] FIG. 4 is a perspective view of a washing machine according to a second embodiment of the present invention;

[0024] FIG. 5 is a perspective view of the washing machine in FIG. 4, in which an interior of the washing machine is partially shown;

[0025] FIG. 6 is a perspective view of the washing machine in FIG. 4, in which cover and filter disassembled from the washing machine is shown;

[0026] FIG. 7 is a perspective view of the washing machine in FIG. 4, in which a

cover is opened; and

[0027] FIG. 8 is a perspective view of a cover of the washing machine in FIG. 4.

#### DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT(S)

5 [0028] Reference will now be made in detail to the preferred embodiment(s) of the present invention, examples of which are illustrated in the accompanying drawings. Throughout the drawings, like elements are indicated using the same or similar reference designations where possible.

10 [0029] FIGs. 1 to 3 illustrate a washing machine according to a first embodiment of the present invention. A structure of a washing machine according to a first embodiment of the present invention is explained by referring to FIGs. 1 to 3 as follows.

15 [0030] Referring to FIG. 1, a tub (not shown in the drawing) is provided in a cabinet 10, and a drum 20 is rotatably provided in the tub. And, a spring (not shown in the drawing) and a damper (not shown in the drawing) are provided between the cabinet 10 and the tub to support the tub elastically. The provided spring and damper play a role in suspending the tub in the cabinet 10 as well as attenuating vibrations applied to the tub while a washing machine operates. Moreover, a motor is provided in rear of the tub so that the drum 20 is connected to the motor to rotates.

20 [0031] A multitude of perforated holes 21 perforate an outer circumference of the drum 20, and a plurality of tumbling ribs 25 are provided on an inner circumference of the drum 20. Hence, water supplied to the tub enables to communicate between the drum 20 and the tub via the perforated holes 21. A laundry having been put in the drum 20 is lifted up by the tumbling ribs 25 to fall down when the drum 20 rotates, whereby a sufficient amount of frictional and shock energy is provided for washing.

[0032] An entrance 11, as shown in FIG. 1, is provided on a front side of the cabinet 10 so that a user puts or pull the laundry in/out of the drum 20. and, a door 14 is provided to open/close the entrance 11. Moreover, a control panel 15 for controlling the washing machine is provided on the cabinet 10. A non-explained numeral '13' indicates a detergent box assembly for storing a detergent.

[0033] Referring to FIG. 2 and FIG. 3, a filter assembly for filtering particles in water is provided in a lower inside of the cabinet 10. The filter assembly includes a filter case 31, a filter 35, and a filter cover assembly 40. The filter cover assembly 40 is explained in detail by referring to FIG. 2 and FIG. 3 as follows.

[0034] First of all, the filter case 31, as shown in FIG. 2, is provided on an internal bottom of the cabinet 10. A bellows 51 connected to a drain (not shown in the drawing) of the tub is connected to the filter case 31, whereby water in the tub flows in the filter case 31.

[0035] A circulation pump 52 and a drain pump 54 are connected to the filter case 31. A circulation hose 53 having one end connected to an upper side of the tub is connected to the circulation pump 52, and a drain hose 55 having one end communicating with an outside of the cabinet 10 is connected to the drain pump 54.

[0036] Hence, when the circulation pump 52 pumps the water in the tub during washing, the pumped water moves to the upper side of the tub via the circulation hose 53 and then falls down into the drum 20. Energy generated from such a falling improves a washing power. When the drain pump 54 pumps the water after completion of washing, the pumped water is discharged outside the cabinet 10 via the drain hose 55.

[0037] The filter 35, as shown in FIG. 2 and FIG. 3, is detachably loaded in the filter case 31. A multitude of apertures 35a are provided in the filter 35, and plays a role in filtering the particles involved in the water flowing in the filter case 31 by being pumped by the

circulation or drain pump 52 or 54. Meanwhile, meshes for removing the particles can be formed in the filter 35 instead of the apertures 35a.

[0038] Since the particles are gathered/attached in/to the filter 35 in using the washing machine, the filter 35 should be periodically cleaned or replaced. In order to load the filter in or out of an insertion hole 31c of the filter case 31, a filter hole 17 is provided on one side of the cabinet 10. And, a filter cover assembly 40, as shown in FIG. 1 and FIG. 3, is provided to open/close the filter hole 17.

[0039] Referring to FIG. 3, the filter cover assembly 40 includes a cover 41, a plurality of protrusions 43 at a lower end of the cover 41, and a hook 45 at an upper portion of the cover 41.

[0040] The cover 41, as shown in FIG. 1, is fitted to the filter hole 17 to cover. A plurality of the protrusions 43 extend from the lower end of the cover 41 downward. The provided protrusions 43 are inserted in a plurality of corresponding holes 31a provided in a lower front side of the filter case 31, respectively. And, the hook 45 protrudes from a center of the upper portion of the cover 41 toward the filter case 31. The provided hook 45 is inserted in a hook hole 31b provided at the upper front side of the filter case 31.

[0041] The above-constructed washing machine according to the first embodiment of the present invention operates as follows.

[0042] First of all, a laundry is put in the drum 20, the door 14 is closed, and the washing machine is actuated to supply water and detergent to the tub. The detergent and water supplied to the tub flow in the drum 20 via the perforated holes 21.

[0043] Once the drum 20 rotates, the laundry is lifted up by the tumbling ribs 25 to fall down for washing. In this case, the circulation pump 52 pumps the water flowing in the filter case 31 via the bellows 51 to the circulation hose 53. The water then moves to an upper



part of the tub via the circulation hose 53 and then falls down into the drum 20 to increase washing power. Meanwhile, the filter 35 filters particles included in the water flowing in the filter case 31 during such a washing step.

[0044] After completion of washing, the drain pump 54 is actuated so that the water flowing in the filter case 31 via the bellows 51 is discharged outside via the drain hose 55. Meanwhile, during the draining step, the filter 35 filters the particles included in the water flowing in the filter case 31.

[0045] After completion of draining, water is supplied to the tub and the drum 20 and the drum 20 is then rotated to rinse the laundry. After rinsing the laundry, the drain pump 54 is actuated to discharge the water in the tub outside. After such a rinsing step is repeated several times, the drum 20 is rotated at high speed to dewater the laundry.

[0046] Meanwhile, after long time use of the washing machine, massive particles are attached to the filter 35 so that it is unable to circulate or discharge the water smoothly. Hence, the filter 35 is unloaded from the filter case 31 so as to be cleaned or replaced. Such a procedure is explained as follows.

[0047] First of all, an upper side of the cover 41 is pulled to separate the hook 45 from the hook hole 31b. The cover 41 is then turned centering on the protrusions 43 inserted in the hole 31a as a central axis, whereby the filter hole 17 is wide open.

[0048] Once the filter hole 17 is opened, the filter 35 is grabbed to be unloaded from the filter case 31. The filter 35 is cleaned or replaced by a new one so as to be inserted in the insertion hole 31c of the filter case 31.

[0049] Once the cleaned or replaced filter 35 is loaded, the cover 41 is turned by taking the protrusions 43 inserted in the holes 31c as a central axis and the hook 45 is then fitted to the hook hole 31b to be fixed thereto. As the hook 45 is fixed to the hook hole 31b

and the protrusions 43 are inserted in the corresponding holes 31a, the cover 41 is completely installed.

[0050] The washing machine equipped with the above-constructed filter cover assembly 40 according to the first embodiment of the present invention facilitates to open the cover 41 for user's convenience.

[0051] Yet, only one hook 45 for fixing the upper side of the cover 41 is provided at the upper center of the cover 41. Hence, upper right and left sides of the cover 41, as shown in FIG. 1, are unable to be completely fixed but protrude out of a front side of the cabinet 10, whereby a step and a gap lie between the cover 41 and the front side of the cabinet 10 to spoil the exterior beauty.

[0052] Moreover, only one hook 45 fixes the cover 41 to exert a weak fixing power thereon. And, if the cover 41 is numerously separated, the hook 45 is broken.

[0053] Therefore, a second embodiment of the present invention is provided to overcome such problems. A second embodiment of the present invention provides a modified filter cover assembly enabling to overcome all the problems of the filter cover assembly according to the first embodiment of the present invention. A washing machine according to a second embodiment of the present invention is explained in detail by referring to FIG. 4 to FIG. 8.

[0054] In describing a washing machine according to a second embodiment of the present invention compared to that according to the first embodiment of the present invention in FIG. 1 to FIG. 3, like elements are indicated using the same or similar reference designations where possible throughout the drawings. Moreover, elements or structures different those of the first embodiment of the present invention are explained in the following to avoid repetition of description.

[0055] Referring to FIG. 6 and FIG. 8, a filter cover assembly 100 of a washing machine according to a second embodiment of the present invention includes a cover 110, protrusions 120, and hooks 130. In the second embodiment of the present invention, the protrusions 120 and the hooks 130 are provided plurally at upper and lower sides of the cover 110. Specifically, there are provided three protrusions 120 and three hooks 130.

[0056] Referring to FIG. 5, a plurality of holes 31a, and more specifically, three holes 31a are provided at a lower front side of the filter case 31 so that the protrusions 120 are inserted to be coupled. Specifically, three holes 31a penetrate into central, right, and left lower front sides of the filter case 31, respectively. Moreover, a plurality of hook holes 31b, and more specifically, three hook holes 31b are provided at an upper front side of the filter case 31. Specifically, three hook holes 31b penetrate into central, right, and left upper front sides of the filter case 31, respectively.

[0057] Meanwhile, the cover 110, as shown in FIG. 4, is fitted to the filter hole 17 provided at the cabinet 10 to cover the filter hole 17. And, the protrusions 120, as shown in FIG. 6 and FIG. 8, extend from the central, right, and left lower sides of the cover 110, respectively. In the second embodiment of the present invention, at least one of the protrusions 120 has a structure unable to be detached from the corresponding hole 31a after insertion, which is explained in the following.

[0058] Referring to FIG. 6 and FIG. 8, at least one of the protrusions 120, e.g., first and third protrusions 121 and 123 at both sides, includes a slit 121a or 123a and a barb 121b or 123b.

[0059] At least one of the slits 121a and 123a is provided at the corresponding first or third protrusions 121 or 123 in a length direction of the protrusions 120, i.e., vertically. If the slits 121a and 123a are provided to the first and third protrusions 121 and 123, respectively,

both sides of the first and third protrusions 121 and 123 enable to be elastically deformed inward and outward. The barbs 121a and 123b, as shown in FIG. 6 and FIG. 8, protrude outside from lower ends of both sides of the protrusions 120. Meanwhile, a second protrusion 122 at the central lower side of the cover 110 fails to be provided with the slit and barb. Yet, the slit and bard can be provided to the second protrusion 122 as well.

[0060] The above-constructed protrusions 120 are fitted to the holes 31a of the filter case 31 to be fixed, respectively. In this case, both lateral sides of the first and third protrusions 121 and 133 are elastically deformed inward to be inserted in the corresponding holes 31a and then elastically restored outward. Thus, once the protrusions 120 are completely fitted to the corresponding holes 31a, the barbs 121b and 123b prevents the protrusions 120 from being separated from the holes 31a. Hence, a user makes use of the protrusions 120 inserted in the holes 31a as a kind of hinge-shaft, as shown in FIG. 7, to turn the cover 110 for closing or opening the filter hole 17.

[0061] Meanwhile, the hooks 130 protrude from central, right, and left upper sides of the cover 110 toward the filter case 31, respectively. Such each of the hooks 130 includes an extension part 131, an elastic part 132, and a barb 133.

[0062] The extension part 131, as shown in FIG. 8, protrudes from the upper side of the cover 110 toward the filter case 31. And, the elastic part 132 is bent from an end of the extension part 131 toward the cover 110. The elastic part 132 lies over the extension part 131, and a predetermined gap is provided between the elastic and extension parts 132 and 131. Hence, the elastic part 132 can be elastically deformed upward and downward. Meanwhile, the barb 133 of the hook 130, as shown in FIG. 8, protrudes from a top of the elastic part 132. The protruding barb 133 is inserted in the corresponding hook hole 31b when the filter hole 17 is covered with the cover 110.

[0063] Each of the hooks 130 may further include a push piece 134 facilitating a user to push. The push piece 134, as shown in FIG. 8, extends from an end of the elastic part 132. Hence, if a user pushes the push piece 134 while the barb 133 is inserted in the hook hole 31b, the barb 133 is released from the hook hole 31b so as to facilitate the user to open the cover 110.

[0064] Meanwhile, it is preferable that there is no step difference between the upper side of the hook 130 and the upper end of the cover 110 to improve the exterior beauty. Hence, the hook 130, as shown in FIG. 8, preferably extends from a groove 111 provided on the upper end of the cover 110. In other words, the upper end of the cover 110 in the vicinity of a portion where the hook 130 is provided protrudes as high as the upper side of the hook 130. With such a structure, the cover 110 enables to entirely cover the filter hole 17, thereby improving the exterior beauty more.

[0065] In using the above-structured filter cover assembly 100, the protrusions 120 are firstly inserted in the holes 31a of the filter case 31. Once the protrusions 120 are completely inserted, the barbs 121b and 123b prevents the protrusions 120 from being separated from the holes 31a.

[0066] If the upper side of the cover 110 is pushed toward the filter case 31 while such a state is maintained, the cover 110 is turned by taking the protrusions 120 inserted in the holes 31a as a rotational axis. As the cover 110 is turned, the hooks 130 are inserted in the filter hole 17. If the barbs 133 of the hooks 130 are finally inserted in the hook holes 31b of the filter case 31, the filter cover assembly 100 is completely loaded.

[0067] Once the filter cover assembly 100 is completely loaded, the three hooks 130 and the three protrusions 120 are instead in the hook holes 31b and the holes 31a, respectively to be fixed. Hence, the outer surface of the cover 110 lies in the same plane of the outer

surface of the cabinet 10. Hence, there is no step difference to improve the exterior beauty. Besides, as the three hooks 130 are fixed, the filter cover assembly 100 is securely loaded.

[0068] Meanwhile, in order to clean or replace the filter 31 after long time use, the push piece 134 of the hook 130 is pushed. The barb 133 is then released from the corresponding hook hole 31b. If the user pulls the upper side of the cover 110, the cover 110 is turned by taking the protrusions 120 inserted in the holes 31a as a hinge shaft. Once the cover 110 is fully turned, the cover 110 is not completely separated from the cabinet 10 since the protrusions 120 maintain to be inserted in the holes 31a, respectively.

[0069] While the cover 110, as shown in FIG. 7, is open, the user draws out the filter 31 from the filter case 31 and then cleans the filter 31 or replaces it by a new one. Then the cleaned or new filter is inserted in the filter case 31 to be loaded. Once the filter 31 is loaded, the user 110 turns the cover 110. When the cover 110 is fully turned, the barbs 133 of the hooks 130 are inserted in the hook holes 31b, respectively so that the cover 110 is completely fixed.

[0070] As mentioned in the foregoing description, the user cleans or replaces the filter 31 after opening the cover 110 with ease and then reloads it with ease.

[0071] Accordingly, the washing machine according to the second embodiment of the present invention has the following advantages or effects.

[0072] First of all, since three protrusions and hooks fix the lower and upper ends of the cover, the filter cover assembly can be securely loaded in the filter hole of the cabinet.

[0073] Secondly, since three protrusions and hooks fix the lower and upper ends of the cover, there is no step difference between the outer surfaces of the cover and cabinet. Therefore, the exterior beauty of the washing machine is improved.

[0074] Thirdly, as the push pieces are provided on the hooks, the user opens the cover

conveniently and easily to clean or replace the filter.

[0075] It will be apparent to those skilled in the art that various modifications and variations can be made in the present invention without departing from the spirit or scope of the invention. Thus, it is intended that the present invention cover such modifications and variations, provided they come within the scope of the appended claims and their equivalents.